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Claims

That which is claimed is:

1. A method of high contrast imaging of semiconductor and metallic sites in an integrated circuit (IC) that simultaneously produces two separate exclusive high-contrast images of the semiconductor and metallic sites of the IC from one light source comprising:

(i) exciting the IC with a focused excitation beam from a light source;

(ii) transverse and axial scanning of the IC by the focused excitation beam;

(iii) producing simultaneously a pair of high-contrast confocal reflectance image $i_r(x,y,z)$ and a low contrast one-photon optical beam-induced current (1P-OBIC) $i_s(x,y)$ of the IC;

(iv) deriving the exclusive high-contrast image $s(x, y, z)$ of the semiconductor sites of the IC from the pixel to pixel product of the 1P-OBIC image and the confocal reflectance image using the equation: $s(x, y, z) = i_r(x, y, z)i_s(x, y)$ where $s(x, y, z) \geq 0$; and

(v) deriving the exclusive high-contrast image $m(x, y, z)$ of the metallic sites of the IC from the product of the complementary 1P-OBIC image and the confocal reflectance image using the equation: $m(x, y, z) = i_r(x, y, z)i_m(x, y)$ where $i_m(x, y) = \kappa - i_s(x, y)$ and κ is a constant that represents the highest $s(x, y, z)$ value that is possible for a given optical set-up.

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2. The method of claim 1, wherein the focused excitation beam is scanned transversely across the IC in a beam-scanning confocal reflectance microscope.

3. The method of claim 1, wherein said light source is laser.

4. The method of claim 1, wherein said light source is a spectrally filtered light source with a broadband spectrum.

5. The method of claims 3 and 4, wherein the light source is directed to a scanning mirror system composed of two galvanometer mirrors for *x* and *y* scanning, and two lenses that constitute a 4f transfer lens.

6. The method of claim 5, wherein another pair of lenses expands and collimates the excitation beam and inputs it to an optical microscope assembly.

7. The method of claim 6, wherein an infinity-corrected objective lens focuses the excitation beam into the IC.

8. The method of claim 7, wherein a precise two-dimensional scan control of the focused excitation beam is achieved via a pair of digital-to-analog converters.

9. The method of claim 8, wherein the reflected light is collected back by the infinity-corrected objective lens and focused by lens towards a pinhole that is placed in front of a photodetector.

10. The method of claim 8, wherein the 1P-OBIC is measured by inputting the output of the pin that is nearest to the probe surface area to a current-

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to-voltage converter composed of an operational amplifier and a feedback resistor.

11. The method of claim 10, wherein the other converter input is the common reference for the electronic circuits including the IC.

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